ME-7166
Vol. 5

tau-tron inc

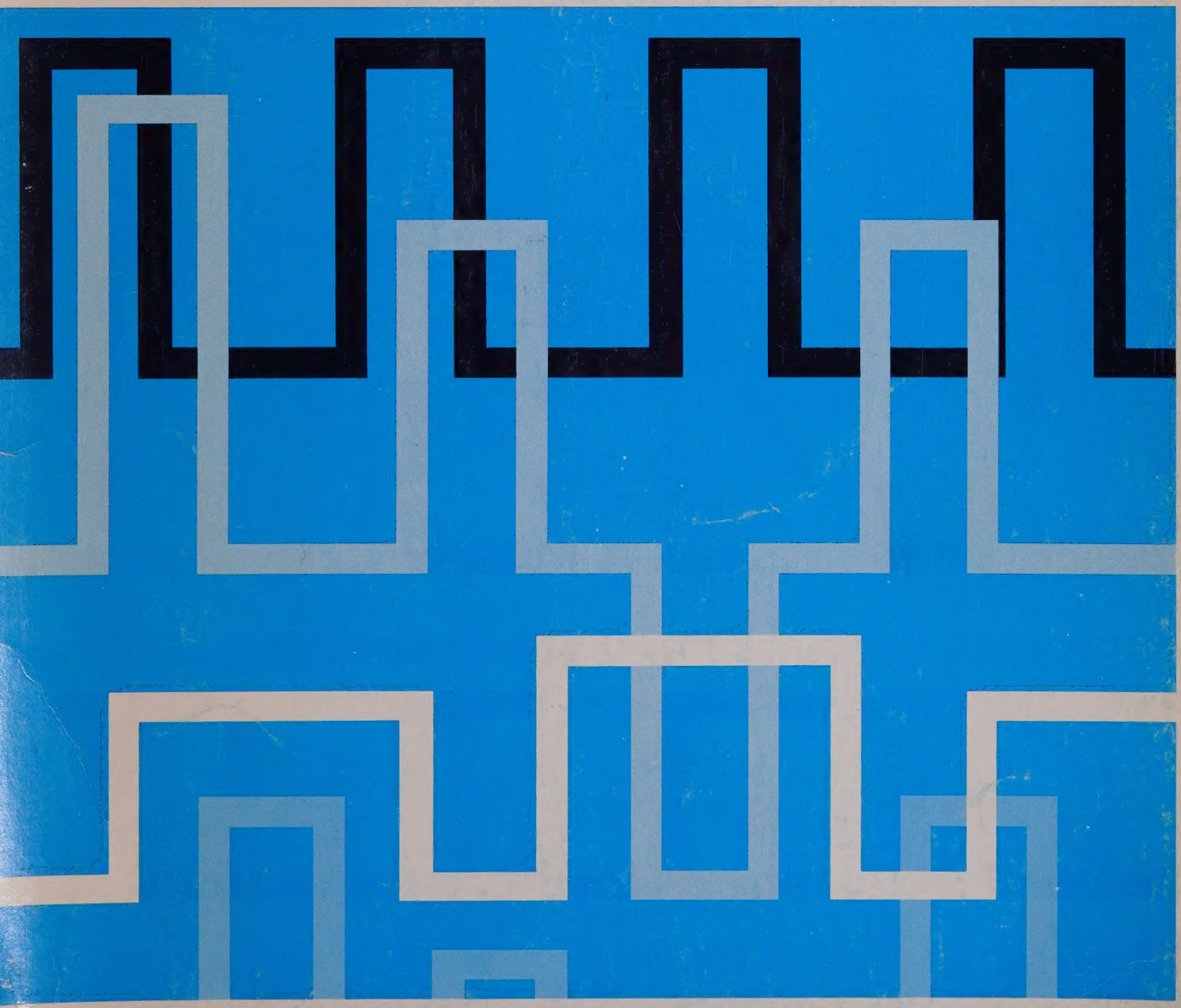
INSTRUCTION MANUAL

MS-2

UHF PULSE SOURCE

ME7166

VOL 5 of 5



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INSTRUCTION MANUAL

MS-2

UHF PULSE SOURCE

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VOL 5 of 5

ME - 7166

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INTRODUCTION

The Tau-Tron Model MS-2 UHF Pulse Source provides stable, digital clock pulses, adjustable from 1 Hz to 300 MHz, for general-purpose system timing. With its array of features, the MS-2 offers versatility as a basic clock source in the Tau-Tron Modular Instrument series.

Two output frequencies are provided: FO, The VCO output, variable from 100 MHz to 300 MHz; and FN, a digitally selected division of FO, variable from 1 Hz to 100 MHz. Dual output connectors are available for both the FO FUNDAMENTAL and the FN FREQUENCY RANGE.

The MS-2 operates in three modes. In the internal (INT) mode, the MS-2 uses its own VCO as a frequency source; the FO and FN frequencies are selected by four controls.

In the external (EXT) mode an externally applied signal is accurately divided down by the FN Range Switches and available at the FN outputs.

In the cyrstal (XTAL) mode (optional), the frequency source is an internal crystal oscillator.

In addition to these modes, a gate input is provided to control the FN outputs.

SPECIFICATIONS

FREQUENCY

Internal (FN)---1 Hz to 100 MHz. Sub-frequency selection of FO in three ranges and up to six sub-multiple steps each.

Internal (FO)---100 MHz to 300 MHz, in two ranges.

External---1 Hz to 100 MHz.

XTAL (Option)---100 MHz maximum.

EXTERNAL IN

One volt p/p minimum amplitude, 5 ns width minimum. 50 ohm input impedance. 5 volt p/p maximum amplitude; maximum +3v pulse top.

GATE INPUT

Standard levels. 50 ohm input impedance. Minimum width 5 ±1 ns.

OUTPUT

FO Output---2 BNC connectors. Standard output.

FN Output---2 BNC connectors. Standard output. Width 50% of selected period.

OPTION

Crystal Frequency.

STANDARD TMI SIGNALS

Logical Zero---Between -200 mv and +600 mv.

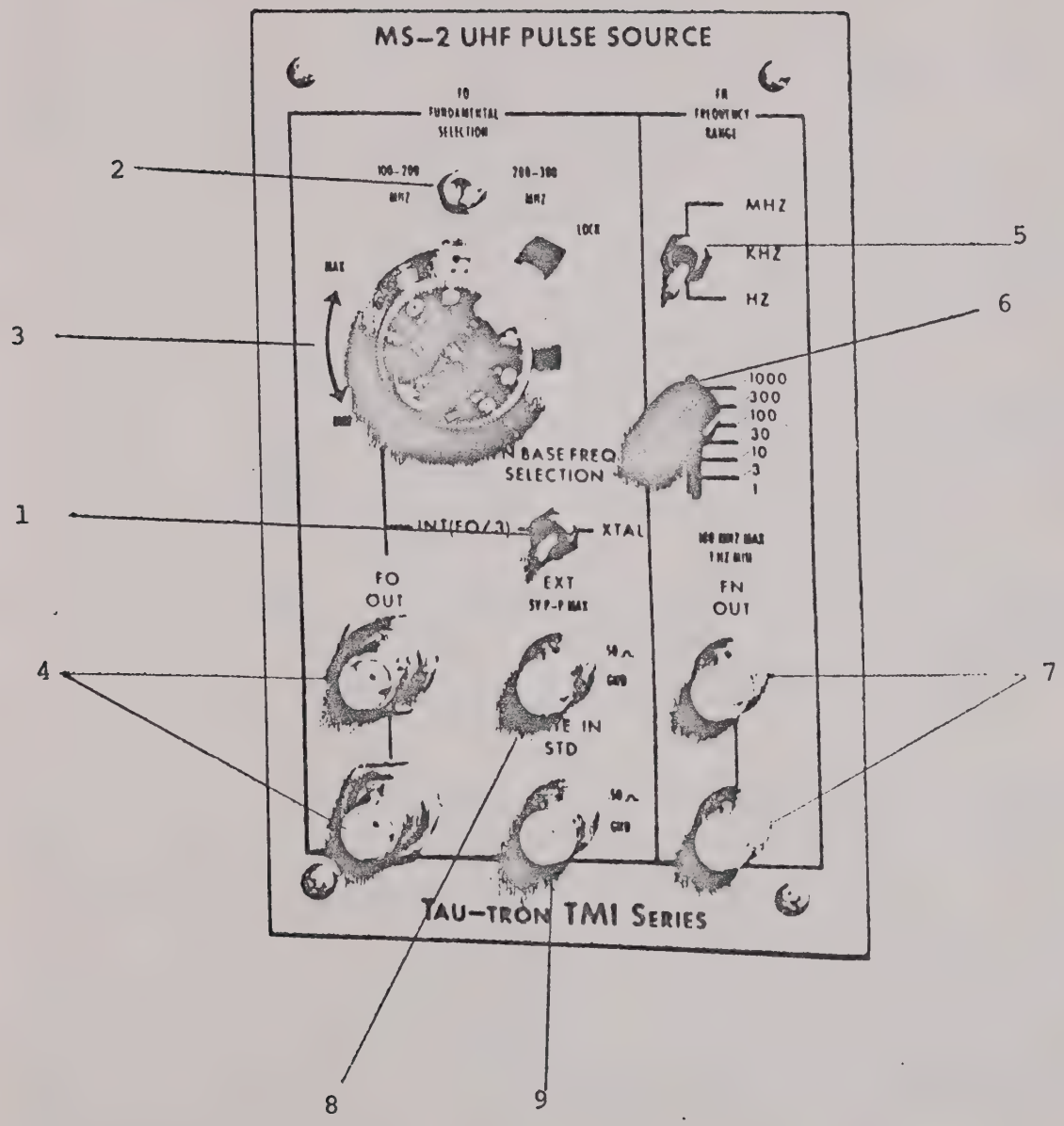
Logical One---More positive than 1.7 volts. (1.5 volts above 100 MHz)

Standard Amplitude---2.0 volts typical.

Transition Edges---Typically 2 ns, 3.5 ns maximum.

Impedance---50 ohms to system ground.

Waveshape Distortion---Less than ±7%, terminated.


MS-2 UHF PULSE SOURCE
FO
FUNDAMENTAL
SELECTION
FR
FREQUENCY
RANGE
100-200
MHZ
200-300
MHZ
MHZ
KHZ
HZ
MAX
MIN
1000
300
100
30
10
3
1
BASE FREQ
SELECTION
INT(FO/3)
XTAL
EXT
FO
OUT
FN
OUT
50Ω
OUT
TAU-TRON TMI SERIES
2
3
1
4
5
6
7
8
9

5. FN Frequency Scale Switch---This toggle switch designates the frequency scale - Hz, KHz, MHz - to be used with the Frequency Range (slide) switch.

6. FN Frequency Range Switch---This six position slide switch is used with the FN Frequency Scale Switch to accurately divide down the FO Frequency in all three operating modes. In the INT (FO/3) mode, each detent specifies a continuous frequency range; fine adjustment is made by rotating the FO vernier control dial while monitoring the FN outputs. Together, these ranges form a total frequency range from 1 Hz to 100 MHz. In the external (EXT) and crystal (XTAL) modes, the vernier control dial does not affect FN, the FN Frequency Range switches together function as a discrete frequency divider. See Table 1.

7. FN Outputs---The dual FN outputs are at standard TMI signal levels. The FN output is a squarewave and must be terminated in 50 ohms to ground. An unused output must still be terminated by 50 ohms to ground for proper signal waveform on the used output.

8. External Clock Input---This BNC input, 50 ohms to ground, will accept a 5v p/p maximum amplitude, +3v maximum pulse top input. It gives the user the ability to accurately divide an input clock frequency; the divided output will appear at FN OUT.

9. Gate Input---This BNC input, accepting standard TMI signals, allows the user to gate the FN outputs on and off, in all three modes of operation. The gating is synchronous with the FN Base Frequency selected. This input is 50 ohms to ground.

TABLE 1

FN FREQUENCY SELECTION

	MHz	kHz	Hz
300 to 1,000	No Output	$\frac{FB}{10^2}$	$\frac{FB}{10^5}$
100 to 300	No Output	$\frac{FB}{3 \times 10^2}$	$\frac{FB}{3 \times 10^5}$
30 to 100	FB	$\frac{FB}{10^3}$	$\frac{FB}{10^6}$
10 to 30	$\frac{FB}{3}$	$\frac{FB}{3 \times 10^3}$	$\frac{FB}{3 \times 10^6}$
3 to 10	$\frac{FB}{10}$	$\frac{FB}{10^4}$	$\frac{FB}{10^7}$
1 to 3	$\frac{FB}{3 \times 10}$	$\frac{FB}{3 \times 10^4}$	$\frac{FB}{3 \times 10^7}$

FB is the FN Base Frequency: either INT (FO/3), or EXT, or XTAL.

TIMING CONSIDERATIONS

INPUTS

Both inputs are asynchronous to the internal logic, and may be applied at any time. EXT will become the clock source (FN Base Frequency) for the FN divider logic, and is therefore "self-synchronizing". GATE IN will be synchronized internally to the selected FN Base Frequency. There will be an ambiguity of one period of the FN Base Frequency from application (or removal) of the GATE IN signal, and its effect upon the FN output.

OUTPUTS

Both FO outputs are typically edge aligned. Both FN outputs are typically edge aligned.

THEORY OF OPERATION

The Tau-Tron Model MS-2 UHF Signal Source can provide a clock signal for equipment operating from less than 1 Hz to 300 MHz. This is accomplished by providing two simultaneous output frequencies: the fundamental VCO output (FO) covers the 100 MHz to 300 MHz band, and the sub-multiple output (FN) covers the frequencies up to 100 MHz.

FO Voltage Controlled Oscillator

The UHF VCO is located on a separate PC board from the FN frequency division logic. It actually consists of two VCO's due to the very wide bandwidth required. Only one VCO is powered at any time via a front panel FO range selection. Both VCO's are identical except for the tank circuit components: one covers the range from 100 MHz to 200 MHz, the other covers the range from 200 MHz to 300 MHz. A front panel ten-turn potentiometer provides precise adjustment of the control voltage over the frequency range selected.

The output of the selected VCO is amplified on the UHF board to provide essentially fixed width pulse outputs (two) driving a 50 ohm external load. Typical pulse width is 1.5 ns at 300 MHz to 3.0 ns at 100 MHz. A divide-by-3 logic circuit prescales the 100 MHz to 300 MHz frequency range of the UHF oscillator down to 33 MHz to 100 MHz for compatibility with the FN frequency division logic.

FN Frequency Division Logic

The frequency source for the FN frequency division logic can be selected via front panel switch to be 1/3 the FO frequency, the optional crystal oscillator, or the external input. A divide-by 3 prescaler and seven decade stages comprise the digital frequency divider circuits. Either the selected frequency source, or the selected source prescaled by the divide-by-three logic is selected as the input to the decade divider chain.

The first decade stage is actually broken down into a divide-by-five and divide-by-two sections. The six remaining decades are driven from the divide-by-5 section, while the selected output stage always passes through the divide-by-2 section. This insures a squarewave output from the decade divider logic.

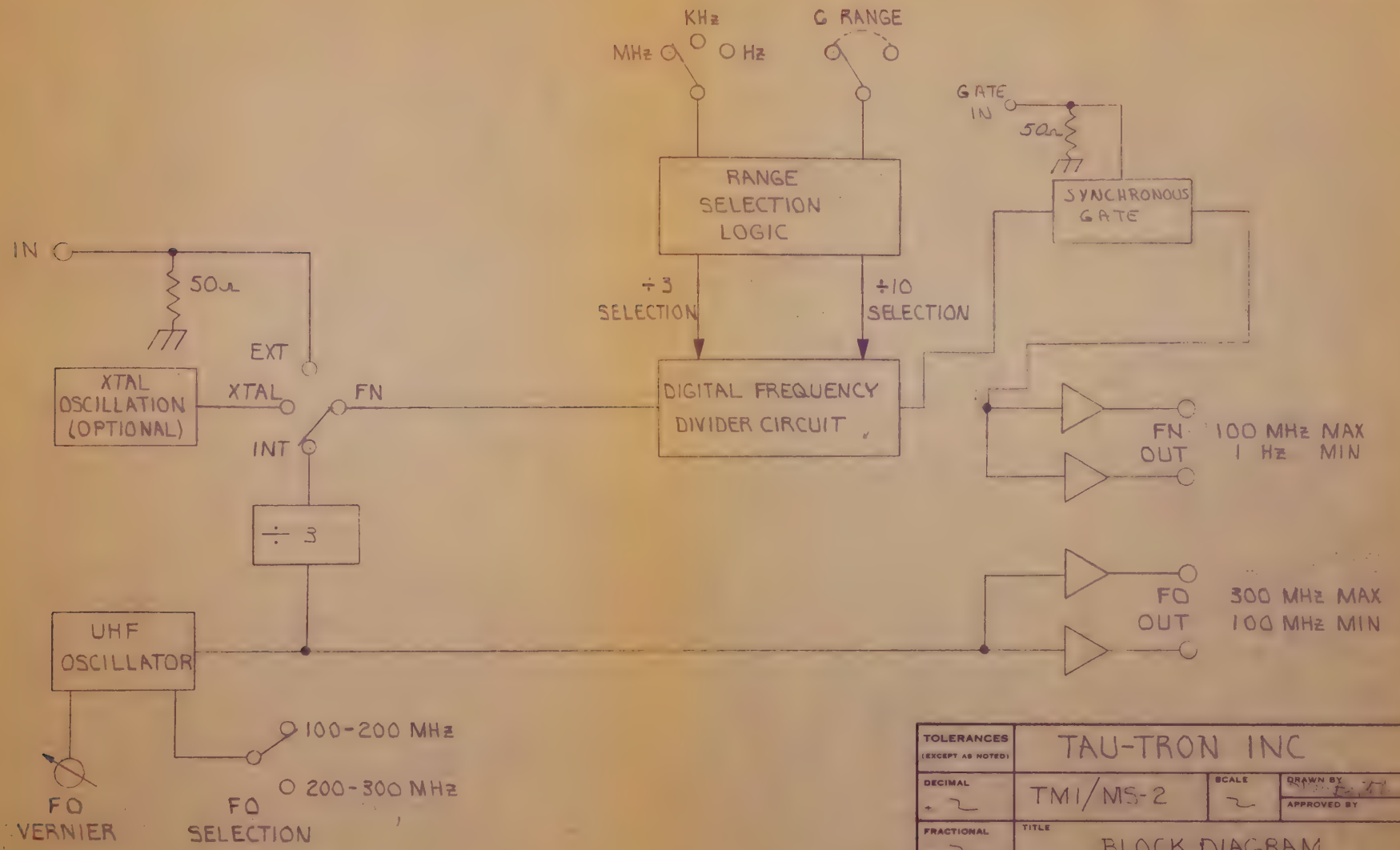
Selection of FN output frequency via the MHz/KHz/Hz range switch and the six-position 1-1000 range switch is decoded to select the decade divider input and the proper output stage for the desired FN frequency range. At the 10-30 MHz and 30-100 MHz selections, the decade divide input drives the output amplifier.

A gate input is provided to allow disabling of the output signal. It is synchronized by receiving the gate input into a latch clocked by the selected output frequency. This synchronizes the enabling/disabling of the output amplifier to the falling edge of the FN signal. When disabled, the FN outputs are forced to a low level.

LIST OF ILLUSTRATIONS

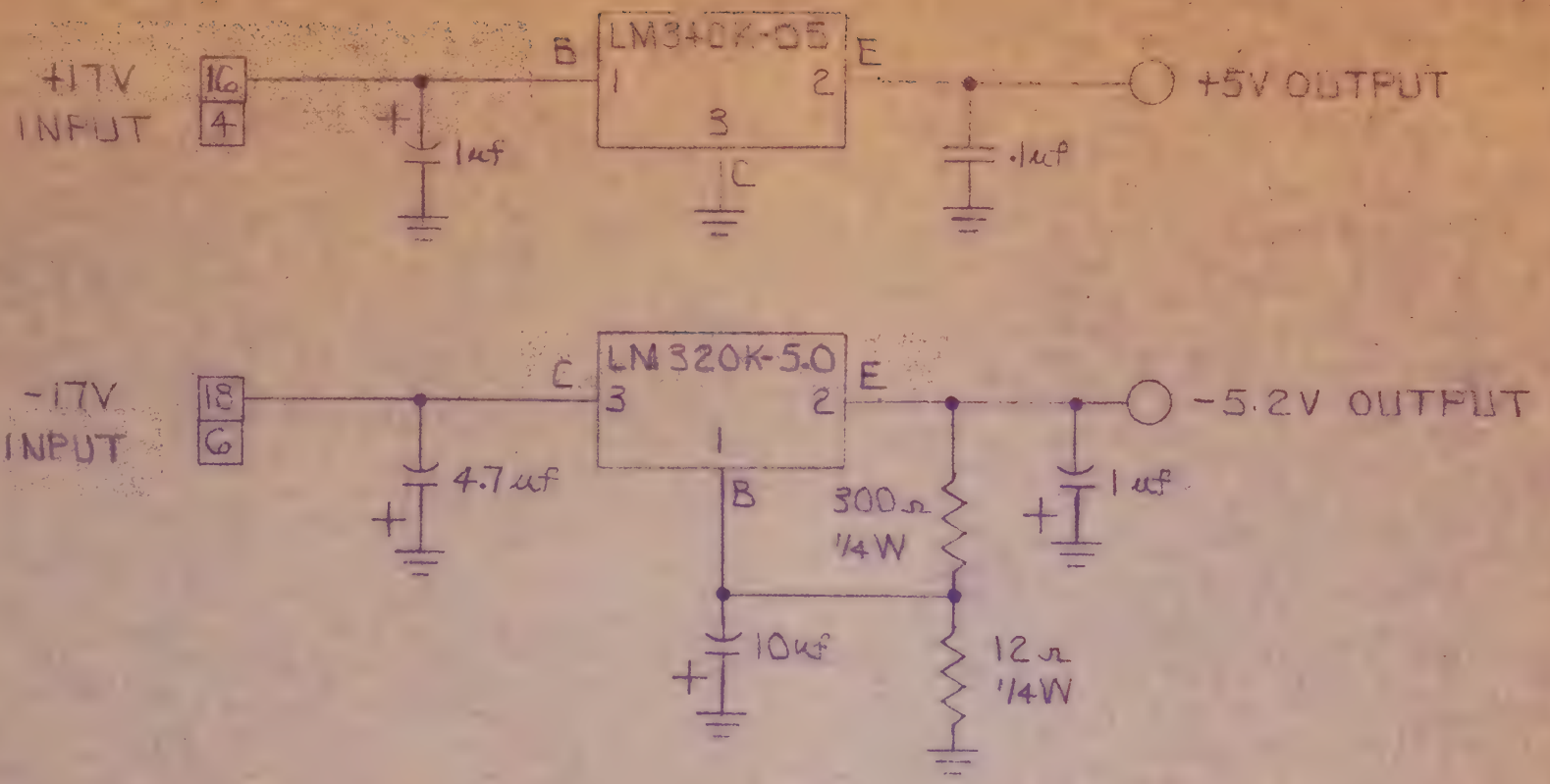
MS-2 Block Diagram. TBN-53348
Module Power Supply TAJ-53382
UHF Oscillator Schematic. TCJ-53324
VHF Oscillator Schematic. TDJ-53922

DATE	SYM	REVISION RECORD	DR	CK
8-22-74	1	PER DCN # 00233	BH	



TOLERANCES (EXCEPT AS NOTED)	TAU-TRON INC		
DECIMAL ±	TM1/MS-2	SCALE	DRAWN BY APPROVED BY
FRACTIONAL ±	TITLE: BLOCK DIAGRAM		
ANGULAR ±	DATE: 8-28-74	DRAWING NUMBER: TBN-53348	REV. 1

DATE	SYM	REVISION RECORD	DR	CK



TOLERANCES (EXCEPT AS NOTED)	TAU-TRON INC		
DECIMAL ± ———	TMI SERIES	SCALE ———	DRAWN BY APPROVED BY
FRACTIONAL ± ———	TITLE SCHEMATIC MODULE POWER SUPPLY (±5V)		
ANGULAR ± ———	DATE 11/5/74	DRAWING NUMBER TAJ-53382	

BRUNING 40-21

OF WIRE MOUNT ON COMPONENT SIDE WITH ≅ 1/8" CLEARANCE TO CARD.

L2 = #22 1" LONG MOUNTED ON WIRING SIDE OF BEND TO FIT WITH ≅ 1/8 CLEARANCE TO CARD.

-5V

470

470

470

IC1 D Q 11 2 9 CL Q 3

IC2 D Q 14 2 9 CL Q 3

IC3 16 8

FO/3 TO MS-1 VHF OSC. BOARD

+5V

.01µf

.01 µf

MV 3102

240

240

150Ω

mmT 3960

mm 4049

*

L1

FD 666

.01 µf

mmT 3960

mmT 3960

200

100

470

470

.01µf

-2V

470Ω -5V

IC4 2 3

470Ω

10 9 IC4 6 7

75

-2V

+5V

100

7.5K

1K

MV 3102

240

240

.01 Uf

150Ω

.01 µf

.01 µf

AF14

mmT 3960

mmT 3960

mm 4049

*

L2

FD 666

.01 µf

mmT 3960

mmT 3960

22 PF

470

200

100

470

470

-2V

-5V

470Ω

470Ω

330

mmT 3960

mmT 3960

mm 4049

mmT 3960

240

240

22

200

100

22

51

+5V

51Ω

22Ω

mmT 3960

75

51Ω

22Ω

mmT 3960

75

+5V

+5V

MS-2 FRONT PANEL FO OUTPUTS

-5V -2V

390

51Ω 1/4W

.01µf

33 µf @6V

130Ω 1/4W

-5V

2N4401

+34V

500

+26V

1N4743

10µf 35V

2K 1/4W

.1uf

104 50V

REAR PANEL

+5V +5V

33µf @6V

NOTES:

1. * TO BE DETERMINED BY TEST.

TOLERANCES (EXCEPT AS NOTED)	TAU-TRON INC.		
DECIMAL .xx	TM1/MS-2	SCALE	DRAWN BY BUDD
			APPROVED BY
FRACTIONAL ±	TITLE: UHF OSCILLATOR SCHEMATIC		
ANGULAR ±	DATE 7-16-74	DRAWING NUMBER TCJ-53324	REV C

DATE	BY	REVISION RECORD	CK	EA

CRYSTAL OPTION B/C-4

EXT E14 — XTAL E14 — INT E14

EXTERNAL INPUT E4

Q1 2N5771 · Q2 2N5771 · Q3 2N5771 · Q4 2N5771

IC20 74LS03

IC1 1660 · IC2 1662 · IC5 10102 · IC6 10138 · IC7 10231 · IC9 74LS90 · IC10 74LS90 · IC11 4518 · IC12 4518 · IC13 74LS15 · IC14 10231 · IC15 10231 · IC16 1660 · IC17 10231 · IC18 1660 · IC19 10231 · IC20 74LS03 · IC21 1662 · IC22 74LS00 · IC23 74LS10 · IC24 74LS03 · IC25 74LS42 · IC26 74LS42

÷5

E7 F0/3 · B2

Q9 2N5771 · Q10 2N2784 · Q11 2N2784 · Q12 2N2784 · Q13 2N2784 · Q14 2N2784 · Q15 2N5771 · Q16 2N5771 · Q17 2N5771 · Q18 2N5771 · Q19 2N5771

S1B02 · S503

E12 · E19

STTL · MHZ · KHZ

FM AMP

NOTE
1. UNLESS OTHERWISE SPECIFIED
   a. RESISTANCE VALUES ARE IN OHMS, 1/8W, ±5%
   b. CAPACITANCE VALUES ARE IN MICROFARADS
2. ⊖ DENOTES 470 OHM, 1/8W RESISTOR TO −5.2V
3. ⬡ DENOTES 16 PIN CABLE CONNECTOR E12 & E19
4. UNMARKED CAPACITORS ARE .01μf DECOUPLING CHIPS.
5. TTL & MOS IC'S VOLTAGE & GND PINS ARE REVERSED. VOLTAGE PINS TIE TO GND. GND PINS TIE TO −5.2V.

TOLERANCES (EXCEPT AS NOTED)	TAU-TRON, INC.
DECIMAL ±	11.3-2
FRACTIONAL ±	SCALE — DRAWN BY — APPROVED BY
ANGULAR ±	TITLE: VHF CLOCK GENERATOR SCHEMATIC
	DATE 7-14-71 · DRAWING NUMBER TDJ-59922 · REV

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WARRANTY

All Tau-Tron products are warranted against any defects in material and workmanship. This warranty applies for one year from the date of delivery for all Tau-Tron manufactured products. The warranty period for OEM products sold by Tau-Tron will depend on the original OEM warranty (consult factory for specific products). We will repair or replace products which, upon our examination, prove to be defective during the warranty period. NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTIBILITY, OR OTHERWISE, IS GIVEN.

For any assistance, contact the factory and be prepared to provide instrument model and serial numbers and all details regarding the malfunction.

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